out of four). In every instance the peritoneal exudate proved to be sterile, thus giving in this respect a uniform result throughout this research.

It is hardly necessary to add that the materials used for inoculation were proved sterile by cultural tests.

The conclusions warranted by these experiments appear to be:

(*a*) The staphylococcus albus is often present as a normal inhabitant of the omentum.

(*b*) When non-bacteriological substances are injected into the peritoneal cavity of animals the staphylococcus albus can usually be recovered from the great omentum.

One of us has cultivated the same white coccus from the omentum in many cases in which the peritoneum was opened, apart from peritonitis. In all these cases the pieces of omentum were dropped into culture tubes of broth and the growth investigated in the usual way.

SAUERBRUCH'S OPERATIVE CHAMBER: HISTORY, EXPERIMENTS, AND EXPERIENCES.[1]

By Bernhard Hahn, M.D.,
OF TACOMA, WASHINGTON,
LATE ASSISTANT TO PROF. V. MIKULICZ, OF BRESLAU, GERMANY.

This paper may serve as a slight tribute to the genius of the late Professor v. Mikulicz, a man who was more popular in this country than any other foreign surgeon and who, perhaps, felt more sympathy for America than any other ever did. The invention in which I wish to awaken your interest is the last of those great boons to humanity which came from the Mikulicz clinic and which have made that clinic famous far beyond the German frontier.

The close relations I maintain with Sauerbruch, my thorough acquaintance with the history and development of his invention, which I followed as an eye witness, and finally the fact that I assisted Professor v. Mikulicz in his operations on men in the chamber, may explain why I feel qualified to write on this subject.

The method is one of performing operations within the thoracic cavity. As I had the good fortune to witness the progress of the work from beginning to end, and had some personal part in it, too, I will endeavor to give an historical picture, without entering into details or scientific argument.

In October, 1903, I was present when my late chief, Professor v. Mikulicz, of Breslau, gave to one of the youngest externes of his clinic this suggestion, to find a way of avoiding pneumothorax, during intrathoracic operations—a problem which naturally was very dear to a surgeon like v. Mikulicz, who had done so much for the development of abdominal surgery and whose ambition naturally strove to overcome the obstacle, which until now had prevented a similar development of thoracic surgery. Perhaps Sauerbruch was especially well fitted for this work as his former scientific training gave him a knowledge of physical laws. In fact, we his colleagues, soon learned of the beginning and progress of his labor and after the first surprising successes in experiments on animals, this subject formed the topic of our daily conversation.

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[1] Read before the County Medical Society at Tacoma, Washington, October, 1905.

I do not need to mention here that the respiratory work of the lung is done by two functions: namely, the active work of the thoracic muscles and the natural elasticity of the lung parenchyma. The equilibrium of these two functions is guaranteed only so long as the pleural cavity remains closed and air-tight. The moment this is no longer the case, the elasticity of the lung will preponderate, the lung will collapse and we have a pneumothorax with all its dangerous sequelæ. A simple consideration must tell us that a pneumothorax would be preventable if it were possible either to produce within the lung an increase of pressure, or to decrease the atmospheric pressure upon the lung from without. Sauerbruch chose the second method. After some other experiments which were quickly abandoned, he came to the idea of inclosing the field of operation; that is to say, the thorax, in a kind of box which represents a vacuum, or more correctly, that contains rarefied air, so as to produce an increase of air pressure from within, which prevents the lung from collapsing after the opening of the pleural cavity. It was evident that operating under such conditions would be most difficult and it was but a step to the idea of placing the whole animal, with the exception of the head, into an experimental cabinet in which there was a pressure lower than the atmospheric. A simple idea, a veritable egg of Columbus, only no one had until then thought of setting it upon its point.

The cabinet first constructed was a cube with wooden walls which were lined with tin and which was as air-tight as possible. This furnished a space of two cubic metres, which was just sufficient to hold an operating table and two men. In one wall there was a round opening which was closed off by means of a rubber septum perforated in the middle. On the opposite wall was a door through which one could enter or leave the room A cylinder was fitted into the third wall, standing in communication with an electromotor, by means of which the air was pumped out of the room. It was at all times possible to note the rarefaction of air by means of a mercury manometer and to control it by a valve.

The animal used for the experiment (dogs being used almost exclusively) was placed on the table, its head forced through the above mentioned opening in the rubber septum and was thus placed outside of the cavity, so that it breathed under natural atmospheric pressure. The narcosis was given under the same condition.

It was indeed a spectacle for me, which I cannot easily forget, when in January, 1903, I assisted at one of these operations for the first time. The operation was already in full progress and could easily be observed through the glass ceiling of the chamber. Sauerbruch with an assistant was in this most primitive box in which the operators could scarcely stand upright. After the resection of the sternal portion of a great number of ribs both lungs lay bare. The pericardium also was laid bare and through an incision in this latter the heart was in view. Each one of these organs was carrying out its physiological function before the very eyes of the observers. The heart made its rhythmical contractions, the lungs their inspiratory and expiratory movements, at the same time expanding wonderfully. My astonishment increased when I beheld Sauerbruch removing all the ribs up to within a short distance of the vertebral column, without interfering in the least with the respiration. Like so many interesting phenomena in the realm of physiology, this surprising fact has been given to us through Sauerbruch's work, namely, that the active work of the thorax to which the action of the lung is bound, is sufficiently kept up if only half of the diaphragm and some insignificant remnants of ribs with the most necessary muscular attachment remain. I should like to ask here whether we are not justified in interpreting this surprising phenomenon much more in this way, that the lung itself takes an active part in the inspiratory expansion, a possibility which, as you know, has been denied until now.

During the first month of 1904 Sauerbruch operated on from seventy to eighty dogs by this method, a great number of which survived for a longer or shorter time after those very serious surgical operations upon the lungs, the mediastinum, the heart, and the œsophagus. A considerable number have remained alive. A number of the others died from infection, which as you understand can scarcely be avoided in dogs. Frequently aseptic and careful operating was not even attempted.

The method had advanced to this point when Sauerbruch and v. Mikulicz presented it to the Surgical Congress in Berlin. Up to this point also the first publications go, which you will find with all their technical details and physiological discussions in Sauerbruch's and v. Mikulicz's articles.[1]

The results obtained until then were so encouraging that a man like v. Mikulicz had a right to dare to attempt the operation on man;

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[1] Zentralb. f. Chirurgie, 1903 and 1904; Verhandl. der Deutsch. Gesellsch. f. Chir., 1904, and especially in the Mitteil. aus den Grenzgeb., 1904, Heft 3.

the more so as it almost always concerned cases otherwise incurable and fatal, or localities which until now had been inaccessible to the knife of the surgeon.

Professor v. Mikulicz, who had followed the entire development of the method with lively interest, now had a cabinet built in his clinic on a grand scale, which not only cost a great deal of money, but also produced many technical difficulties. This chamber has the shape of a cube and contains forty cubic metres of space. Floor and ceiling, as well as the four walls up to about one metre in height, consist of strong iron, the rest of the walls of very strong glass. The whole thing is constructed absolutely air-tight, as well as the double door which is held tightly closed by means of an iron beam pressing against a thick rubber incasement. Opposite this there is exactly, as in the original dog chamber, on a level with the operating table, a circular hole which is closed by a rubber septum. The hole, again, has a circular opening through which the head of the patient can be forced without difficulty, whereupon the septum spontaneously closes around the neck like a cuff. A third wall bears the evacuating apparatus consisting of a suction pump which is driven by a one-horse power electromotor and which has a suction power of three hundred litres per hour. Next to it there is a valve which permits the renewal of air within and regulates the rarefaction of air with respect to the air pressure. All this is managed inside of the cabinet. In case the electromotor should accidentally stop working there is a hand pump in reserve. A negative pressure of ten millimetres of mercury proves to be sufficient to guarantee the expansion of the lung. As far as I can remember, the air pressure was approximately fifteen millimetres below the atmospheric pressure.[1] The entire chamber, therefore, corresponds quite closely with the little experimental cabinet and only in one respect does it differ essentially. Since the atmospheric pressure upon the entire venous system is increased in this chamber the venous circulation would naturally go on considerably slower, the aspiratory work of the pleural cavity would be much diminished, and in this way more work would be exacted of the left ventricle. This obstacle is overcome by placing the whole body of the patient, from the ribs down, into a rubber sac which communicates with the outer air, thereby keeping out the influence of the pneumatic cabinet and placing the venous system under the ordinary atmospheric pressure. But this sac was not used in connection with all our operations. The cabinet is lighted by an electric arc light fastened to the ceiling; a transportable incandescent light is also at hand.

Let us now proceed with the operation: The patient, not yet fully anæsthetized (chloroform being preferable to ether), is brought into the cabinet and placed upon the table, his head, forced through the rubber cuff, rests outside upon a small table, beside which the anæsthetist has his seat. The door of the cabinet is closed and the apparatus set in motion. There is just room for the operator, two assistants, one man who handles the instruments and another who attends to all the mechanical apparatus. Besides that there is room for two small tables on hinges on which the instruments, the dressings, and the irrigating fluids are placed. As soon as the manometer shows an air pressure of minus twelve to fifteen millimetres the operation begins.

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[1] The operations are now performed at a pressure of —6 to —12 mm.

By this time it is likely that various doubts have arisen in your minds. You will ask, Is not the anæsthetic most difficult under such conditions? Well, taking for granted that we have a conscientious and capable anæsthetist the narcosis can be carried out in the usual way and I cannot say that we had any more accidents in the cabinet than under ordinary conditions. The anæsthetist, as well as the operator, can watch the pulse. One need not fear the compression of the neck and its vessels by means of the rubber cuff, although the latter substance clings very tightly under the atmospheric pressure. Besides being able to use a sign language the operator and anæsthetist are in communication by means of a telephone. Nevertheless, it must be admitted that in cases of immediate danger, such as asphyxia, etc., it is somewhat more difficult to employ energetic measures than under ordinary conditions. The body of the patient is, as one might say, divided into two parts; the anæsthetist who is outside cannot come near the trunk and those inside the cabinet cannot reach the head. Possibly you will wonder how the operator fares within this cabinet. Well, I have myself operated for hours with Professor v. Mikulicz in this chamber and I can assure you that I felt quite well. To be sure the activity of the sudoriferous glands is increased, but operating in our cabinet is no worse than in the tropical heat of an operating-room facing the south and exposed to the rays of a noonday sun. Sauerbruch calculated that in the cabinet with a negative pressure of ten millimetres of mercury one lives under the same atmospheric pressure as on a mountain of three hundred metres. This certainly does not indicate any marked difficulty in breathing.

I am afraid that I have already gone too far into detail in the introductory part and in the consideration of the technicalities of the method, and now turn to that which will interest you most, the results we obtained in our operations on man. I judge the number of the operations performed in the cabinet during the months of May, June, and July was at least a dozen. I regret that I cannot give any reliable statistics, since at this moment I have no data at hand, so I must depend entirely upon my memory.[1] Moreover, as an assistant of the private clinic, it was not possible for me to follow closely those patients which were operated upon at the University clinic. Among these, there were operations upon the lung, the œsophagus, the heart, and the thorax itself. First I will speak about the œsophageal cases, as in the entire undertaking v. Mikulicz had the œsophagus principally in mind and it was just in this direction that he had placed his hopes on the new method. The œsophagus lies so hidden and covered by vital organs that the gaining of an entrance is of itself difficult and venturesome. After all attempts at preventing a pneumothorax from the front proved in vain the attempt was made to accomplish this from the back. Although in individual cases, in experiments upon animals, one succeeded in preventing the opening of the pleural cavity, this way also soon proved inadequate. Before all else v. Mikulicz intended to attack this inaccessible region with the help of the pneumatic cabinet, but it was just this part of the work which did not turn out encouragingly. To be sure, on dogs, we succeeded in resecting a couple of inches of the œsophagus and in uniting the ends, and even if the animals finally died it was for the most part due to the fact that it was impossible to keep them properly quiet and to nourish them through a stomach fistula. Since this annoyance can usually be avoided in a human patient one had a right to expect that in man results would be better. Alas, we encountered here other great hindrances. Among these in the first place was the shock, which was produced by displacement of the lung or occasionally of the heart, and by operating at such a depth; it was so enormous at times that threatening phenomena appeared and the operation had to be stopped. Or a carcinoma proved inoperable after laying the œsophagus bare. A few times it resulted in infection and empyema.

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[1] I am now able to furnish exact data: There were 5 operations on the œsophagus, 1 on the heart, 8 on the lungs, 2 on the thorax.

A woman who had carcinoma of the œsophagus was put under my special care and I followed the course of the treatment with special attention. In this patient we had previously established a stomach fistula which had improved her nutrition essentially. She was only thirty-eight years old and the œsophagoscope, which in our clinic was used in every œsophageal case, showed a small, circumscribed tumor, which after an exploratory excision with the help of the œsophagoscope, proved, microscopically, to be an epithelioma. The case seemed to be particularly favorable for an operation and yet it was the one which of all our cases ended in the saddest way. Soon after the opening of the pleural cavity and the displacement of the lung, the patient became dyspnœic and pulseless, and succumbed soon afterward. Whether this is to be attributed to the narcosis or shock I do not dare to say. The case was a mystery to us all. We used in this instance preoperative injections of nuclein to produce a hyperleukocytosis to combat, if possible, peritoneal infection. These injections were used in all our cases in which the digestive tract was operated upon. It may be that this had something to do with the causation of death. The woman showed a very bad reaction even before the anæsthetic was started. There was some fever and a pulse frequency of 176. In short this unfortunate event was never cleared up.

Two other cases of œsophageal carcinoma were operated upon. After exposing the tumors they were found to be inoperable. Both of these patients died from pleurisy. The danger of infection is always great, as the pleura is much more vulnerable to infection than is the peritoneum.

I should like to describe to you here a little more in detail the v. Mikulicz method of operating, in order to make it clear to you that these operations upon the œsophagus must necessarily always produce a severe shock. We must give up trying to build a large thoracic flap in order to have an easy way to get at the œsophagus, since this would render an air-tight after-union impossible, or at any rate very tedious. So we perform the simple thoracocentesis in the fourth intracostal space through an extensive parallel incision. The wound is then forced into a wide gap by forcibly tearing the ribs apart by means of an automatic retractor which is constructed like the one used for tracheotomy, only being much larger and stronger. This act, which frequently requires considerable strength, as well as the separation of the lungs, is especially apt to produce severe shock. In fact, the resection of a rib or two is sometimes safer and may be preferable to that violent procedure. The remaining instruments are the same as are generally used at the clinic, only the scissors, forceps, needle holders, etc., must be considerably longer. Manipulating them must also be learned. Hence as long as I was connected with the clinic the results of our œsophageal operations were not satisfactory.

Furthermore, several cases of gangrene of the lung were operated on, as far as I know with good results. I know you will say "gangrene of the lungs has been operated upon with good results long ago." To be sure, not only that, but there has even existed an established surgery of the lungs, which was developed into its modern form and with its special technique by Quincke, of Kiel. I know from my assistantship in Hamburg-Eppendorf that Lenhartz got very good surgical results in his work on gangrene of the lungs without the aid of the pneumatic cabinets. These, however, were only very lucky cases, so-called show cases, which had been especially selected. He decided to operate only when there were, in all probability, pleuritic adhesions and when the location of the lung focus could be previously determined with comparative certainty. Everyone knows how difficult this is at times, but to search for the focus during the operation was, candidly speaking, impossible. In the pneumatic chamber, however, this could be done with complete composure. A good result was achieved in a case of bronchial fistula.

I also witnessed an operation upon the heart which was performed by one of v. Mikulicz's assistants. It was a stab wound. The man was brought into the chamber in a collapsed condition, but with a fairly good pulse. After resecting two or three ribs the pleural cavity was opened. The lungs expanded beautifully and after dissecting several layers of tissue the operator thought that the heart, covered with blood clots, lay before him, while in fact it was only the pericardium. The whole appearance of the heart had been changed to a great extent by the fluid infiltration and suggillation. This unfortunate mistake was fatal to the patient. Without it we would have found the wound of the heart more quickly and could have sutured it and possibly saved the patient. Finally, after opening the pericardial cavity and removing the large amount of coagulated blood which filled it, and when the stab wound of the heart muscle was in plain sight, the patient had already bled to death. As you will see, the technique of operating upon the heart and pericardium, also, is modified by the use of the pneumatic chamber, since the discussion about the best and least dangerous point of entrance to the heart is of no importance at the moment when one no longer has to fear the opening of the pleural cavity. We have forerunners in this field of activity also. I recall Rehn's bold deed, Pagenstecher and others, but this field, like surgery of the lungs, has remained very sterile until now.

Finally, I can report a case of surgery of the thorax in which I assisted Professor v. Mikulicz. It was a sarcoma of the thorax the size of an apple, surrounding the third rib and situated above the nipple. The tumor was resected together with a portion of rib the length of a finger. Again the lung expanded beautifully. It took some time to control the bleeding. The thoracic wound was then closed by suturing the anterior costal and pectoral muscle with strong catgut and by exact union of the skin. The whole operation was done without hurry and without the least disturbance. Pulse and respiration of the patient continued good during the whole time. In spite of the fact that because of the considerable loss of blood and our customary normal salt solution irrigations some fluid had collected in the pleural cavity, so that I noticed a hydrohematothorax the next day. In spite of this the recovery was perfect; the patient was discharged on the ninth day and soon afterward sent to her Russian home.

By microscopic examination I was able to determine a mixed-celled sarcoma.

An extensive carcinoma of the breast which had grown into the thoracic wall was operated upon with perfect result. A large skin-muscle-flap was set upon the expanded lung.

If I may be allowed to return once more to the subject of œsophageal operations I would say that the cause of our meagre results does not lie in the inefficacy of the cabinet, but rather in the technical difficulties which under all circumstances go hand-in-hand with operations for carcinoma of the œsophagus.

These difficulties are caused: first, by the location of the organ;

second, by its anatomical condition; and third, by the imminent danger of an infection of the pleural cavity.

First. The operation is performed at a great depth, the operator struggling with the lungs, which are constantly pressing forward and which can be kept back only with much difficulty by means of broad depressors or retractors. Care must be taken not to injure the vagus nerves. The aorta and its numerous branches lie dangerously near. If we are fortunate to succeed in resecting the diseased piece of the œsophagus, we have yet the more difficult task of reuniting the latter. In the first place the œsophagus is not at all movable, since it is just long enough to go the shortest way from the stomach to the mouth. Furthermore, it is tightly adherent to a broad support by means of strong connective tissues. Thus the suture naturally suffers a dangerous tension.

Regarding the frequently occurring carcinoma of the cardiac end, the difficulty can be eliminated by a technical manœuvre, which v. Mikulicz first applied with success in his experiments upon the dog and which he has transferred upon the human body in his experiments upon the cadaver. The cardiac end of the stomach can be pulled up directly through the œsophageal opening in the diaphragm and in this way it can be united with the proximal segment of the œsophagus. Notwithstanding this fact it is, however, difficult to secure a safe union, because in this position it is unfortunately not possible to cover the line of suture throughout with serous membrane, after the manner which is employed so advantageously in intestinal suture, because the œsophagus is only partially covered with pleural tissue, which, moreover, is movable only to a slight extent. On this account it is scarcely to be expected that an œsophageal suture will ever be as safe as an intestinal suture. For this reason it is necessary to make use of drainage, which in turn threatens an infection of the pleural cavity. In order to prevent the formation of a pneumothorax because of the presence of drainage after the completion of the operation, we have constructed a contrivance out of rubber which makes an air-tight closure over the dressing covering the thorax. I will show further on how Sauerbruch, in his latest experiments, has overcome these difficulties.

It does not seem to me that this report about clinical experience is entirely discouraging. It is to be expected that further improvements will be made in the construction of the cabinet. Dr. Gaylord, of Buffalo, New York, has written me that he has constructed a cabinet. It is quite possible that he has already improved upon the original. Others are built in Paris, Berlin, Leipsic, Cologne, Greifswald, New York. Professor Tuffier, of Paris, has taken a special interest in the work. He has experimented on a large scale, and expressed himself in favor of the method.

At this point it is proper to refer to a recent method which may possibly take the place of Sauerbruch's cabinet, and which undoubtedly has the advantage of greater simplicity. In the beginning of my paper I touched upon the possibility of reaching the same end by another route: namely, by producing an increased pressure within the bronchi, due to the physical difference between bronchial and pleural pressure. This is the so-called "Uberdruckverfahren." This method was studied by Brauer and Peterson, of Heidelberg, during 1904 and following Sauerbruch's work. Many years before this, however, similar apparatus had been employed. The French surgeons, Tuffier and Hallion, and also your countrymen, O'Dwyer and Matas, have made very interesting and valuable experiments in this direction. Their experiments consist essentially in inflation of the lungs by means of bellows, as you understand, in a kind of artificial respiration, but they did not attain a practical result as the methods were insufficient. An improvement was invented by Matas, which consisted in the use of a graduated air pump. This, method has as yet not been applied practically to a great extent. Brauer was the first one to work out this "Uberdruckverfahren" in a practical way. He developed a method in which he made use of a small cabinet with positive air pressure. This cabinet contains approximately one-third of a cubic metre air space, in which the air pressure exceeds the normal atmospheric pressure to a sufficient extent to keep the lungs expanded. The head of the animal is inserted into this cabinet through a diaphragm, in a similar manner as in Sauerbruch's cabinet, the body remaining outside; the anæsthetist also introduces his hands into the cabinet through rubber cuffs and carries out the anæsthesia with an appropriate apparatus. Petersen has in this manner successfully operated upon the heart and lungs on a number of dogs. The simplicity and diminutive size of this apparatus undoubtedly has many advantages, but it seems to me that the anæsthetist works at a serious disadvantage under the conditions described above. Sauerbruch himself considered this method before it was developed in Heidelberg. He also made a number of experiments in this direction, but later abandoned the method because it seemed to him that there were many objections to its use, which I cannot discuss in this paper because of lack of time.

Although there has been little or no work done with the cabinet since my departure from Breslau, due to the paralyzing effect of the long illness and death of the Chief of the Clinic, and while there have been no more operations on man, still the indefatigable inventor has brought his work much nearer to perfection.

The results had been bad enough so far as suture of the œsophagus and infection of the pleura are concerned. We could all see that improvement here was imperative if future progress was to be made. Sauerbruch lost no time. While the surgical world began to look skeptically at the whole matter, he went back to animal experimentation, using now the larger chamber. It was self-evident that many improvements in the technique of operation must be made, especially in the œsophageal work. This was a most difficult but also a most attractive problem. The œsophageal suture was more difficult than all else. As I have already stated, the unfavorable anatomical structure of the wall of the œsophagus makes it almost impossible to get a tight circular suture. There is no serosa, a weak muscular coat and a mucosa of little vitality. There is always great tension after the resection of a segment. As the stitches nearly always cut through, no matter how they are put in, food passes into the pleural cavity and the animal dies from empyema and pyæmia. All kinds of devices have been employed to make the suture secure and lasting. The suture has been modified in numerous ways, but to no purpose. *The stitches cut through.* Mikulicz had been the first to avoid tension on stumps by bringing a part of the stomach through the diaphragm and using it as a plastic covering for the œsophageal suture. This also made the suture more secure. Sauerbruch combined this idea with the use of the Murphy button, thus avoiding the suture entirely. In this way he obtained such good results that he claims the *Murphy button* to be the *conditio sine qua non* of all success in this work. He has operated upon dozens of dogs, all of which got well. These dogs now take all kinds of food except bones. In each of these dogs a piece of the œsophagus was resected, in some as much as three inches. The essential points in the operation are the intrapleural displacement of the stomach and an anastomosis between the œsophagus and the stomach by means of the button.

I might briefly describe the operation as follows:[1]

The animal is brought into the cabinet and fastened upon his right side. The pleural cavity is opened in the fifth intercostal space and the ribs are separated by the Mikulicz automatic rib retractors. The lung is pushed aside, whereupon the œsophagus and aorta and both pneumogastric nerves appear. We catch the œsophagus with a tenaculum forceps just above the hiatus, stretching it a little, and make, close to it, an incision into the septum diaphragmaticum which here consists entirely of pleura and peritoneum. This opening is sufficient to pull through the fundus ventriculi. The next step is the introduction of the Murphy button. This is done by an assistant outside the cabinet. With a bougie he first introduces the female half of the button, through the œsophagus as far as the stomach cavity. There it is caught by the operator and brought into that part of the fundus which was displaced into the pleural cavity. Here a very small incision is made through which the button is forced. The other half is introduced and pushed against that part of the wall of the œsophagus where the anastomosis is to be performed. A small incision is also made here, the button adapted to it, and both halves brought together and closed. No suture whatever is made. The last important step is the fixation of the fundus ventriculi to the diaphragm. It is done by suturing the protruding stomach all around the slit in the diaphragm. Of course the operation must be modified in some special points when performed upon man and under pathological conditions. When the button cannot be passed down the œsophagus, as will be the case in most benign strictures, in diverticula, and even in most carcinomatous conditions, the button must be introduced per ventriculum. In carcinoma, the resection should be done after the establishment of the anastomosis. When the anastomosis is finished, a strong silk ligature is passed around the œsophagus below the button and tied tightly. The carcinomatous piece of the œsophagus is then dissected off after isolation of the pneumogastric nerves. The lower end is closed in the same way and in addition is inverted in the stomach and buried by a purse-string suture exactly like an appendix. The upper stump is now covered by the fundus ventriculi.

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[1] Sauerbruch's Publications in Zentralblatt f. Chirurgie, 1905, No. 4; Verhandl. der deutsch Gesellsch. f. Chir., 1905, and principally in Mittheil. aus den Grenzgeb., 1905, 2.

All these procedures have been effectually carried out on the cadaver and there is no doubt that they will be applied to the living subject as soon as a new chief of clinic is appointed. Although the results which have so far been obtained have been only moderately successful it must be remembered that they follow only the earliest observations. When considering the three operations for carcinoma of the œsophagus we must remember that they were done before Sauerbruch's latest improvements in operative technique.

There is no doubt but that the opinion of Professor v. Mikulicz, which he expressed at the Congress in Berlin in 1904, is correct, when he stated, that we are entitled to the expectation of better and more satisfactory results. He hoped to be able to attack, aside from the above mentioned conditions, also injuries and defects of the diaphragm. He even suggested the possibility of interfering with certain valvular heart lesions, an American surgeon having already mentioned the incision of mitral stenosis. It would seem to me, that the method might be successful especially in the extraction of foreign bodies from the bronchi, for the treatment of diverticula of the œsophagus, and more especially for the removal of foreign bodies impacted in this organ. All of these operations would, of course, promise much better results than the carcinoma of the œsophagus. Naturally, the new method will first have its fatal results as has every other new operation. On the other hand, it must be remembered that the victim of carcinoma of the œsophagus has, without operation, only to await a certain, slow, and dreadful death. Should he recover from the operation he has a good chance for his life, as carcinoma of the œsophagus grows slowly, involves only late the neighboring glands and makes very late metastases to other organs. So we can easily see that here, as in many other surgical conditions, an early diagnosis is essential. Sauerbruch remarks: "If cases of œsophageal carcinoma are sent to the surgeon in time, there will certainly now and then be found a case suitable for operation. That will likely, however, be true only far in the future." I have just received a letter from Sauerbruch in which he tells me that v. Mikulicz himself said to him only a few days before his death: "With our method we will make possible an operation for carcinoma of the œsophagus."

Das klingt ganz anders als der trostlose Ruf, in den bisher jeder Forscher nach vergeblichen Mühen und Arbeiten auf diesem Gebiete ausgebrochen ist: Lasciate ogni speranza!

THE SURGICAL TREATMENT OF HEPATIC CIRRHOSIS, WITH SPECIAL REFERENCE TO BILIARY DRAINAGE.

By Charles Greene Cumston, M.D.,
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In the issue of the *Boston Medical and Surgical Journal* for August 11, 1905, I published a paper relative to the value and indications of omentopexy in cases of cirrhosis of the liver with ascites, but in the present paper I intend only referring to drainage of the biliary tract in certain cases of hepatic cirrhosis. The surgical treatment of this condition has been simple exploratory laparotomy, laparotomy combined with destruction of adhesions, with or without massage of the biliary tract, and lastly, laparotomy followed by cholecystostomy. The first two interferences are not within the limits of this paper and consequently I will not refer to them again.

In the first place I would rapidly consider the most essential facts relative to the pathogenesis of hepatic cirrhosis, which may be defined as a generalized proliferation of interstitial tissue, accompanied by various pathological changes in the hepatic cell. In other words, a cirrhosis merely represents a chronic hepatitis which is the ultimate stage of an irritative process of the liver, having for a starting point the biliary tract or the bloodvessels. It is at the present time an established fact that infection is the primary etiological factor in certain cases of cirrhosis, the infectious agent being propagated from the intestine to the liver by way of the biliary tract. Hypertrophic biliary cirrhosis with chronic icterus represents the most perfect type of this morbid condition. But, in order to understand fully this question of hepatic pathology, one should not forget that roughly speaking the liver may be reduced to an hepatic cell, united to the intestinal tract by an excretory canal. The latter is in direct continuity, both anatomically and physiologically, with